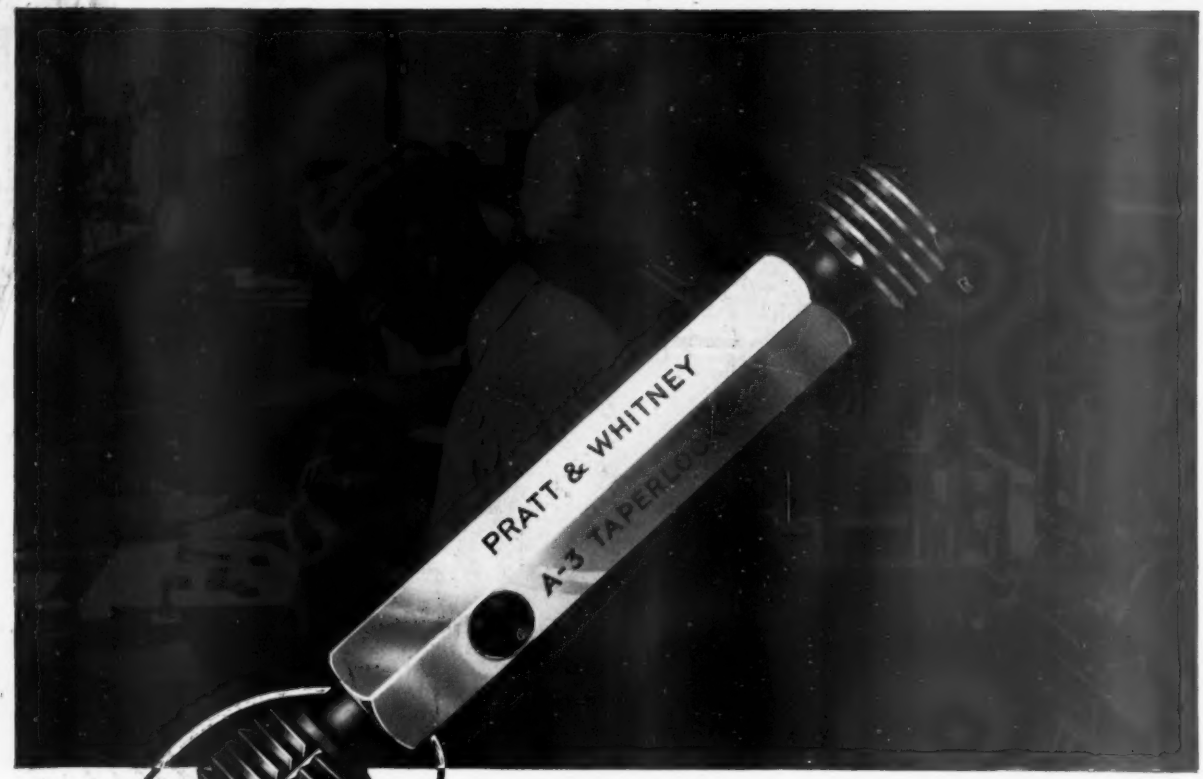
The Tool Engineer

Official Publication of the
AMERICAN SOCIETY OF TOOL ENGINEERS



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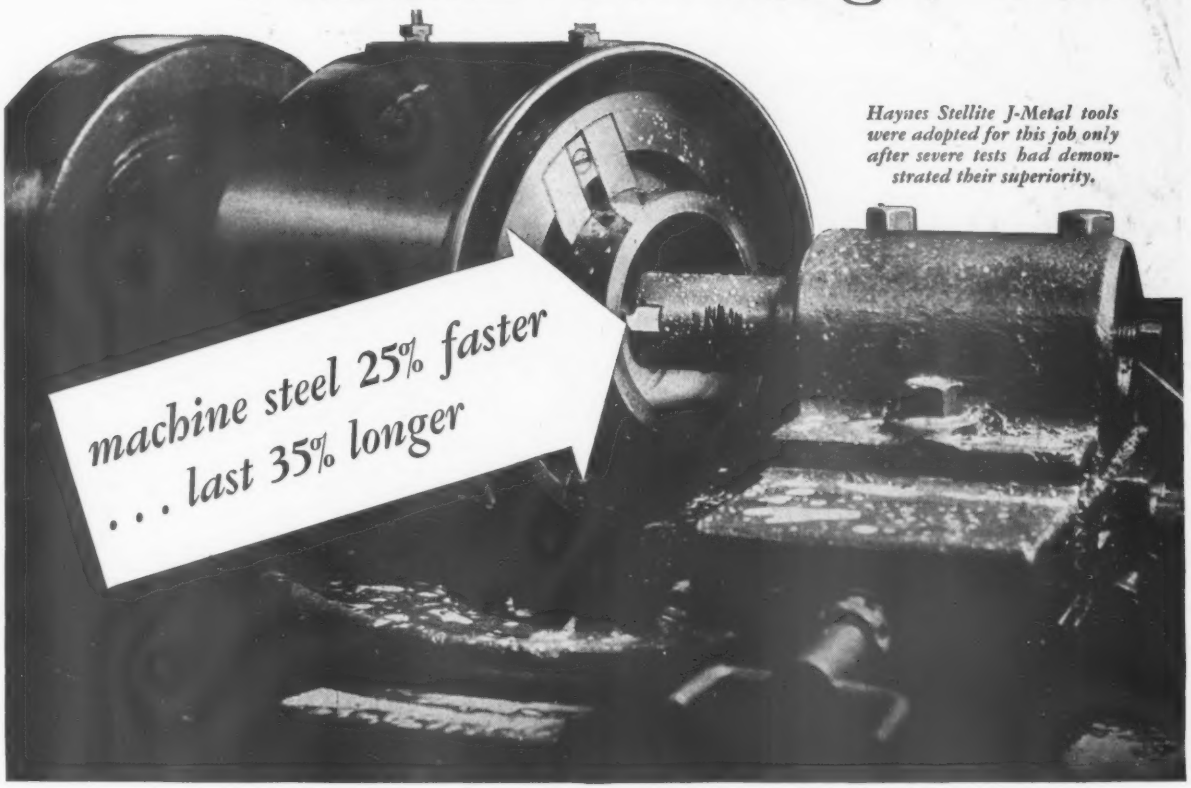

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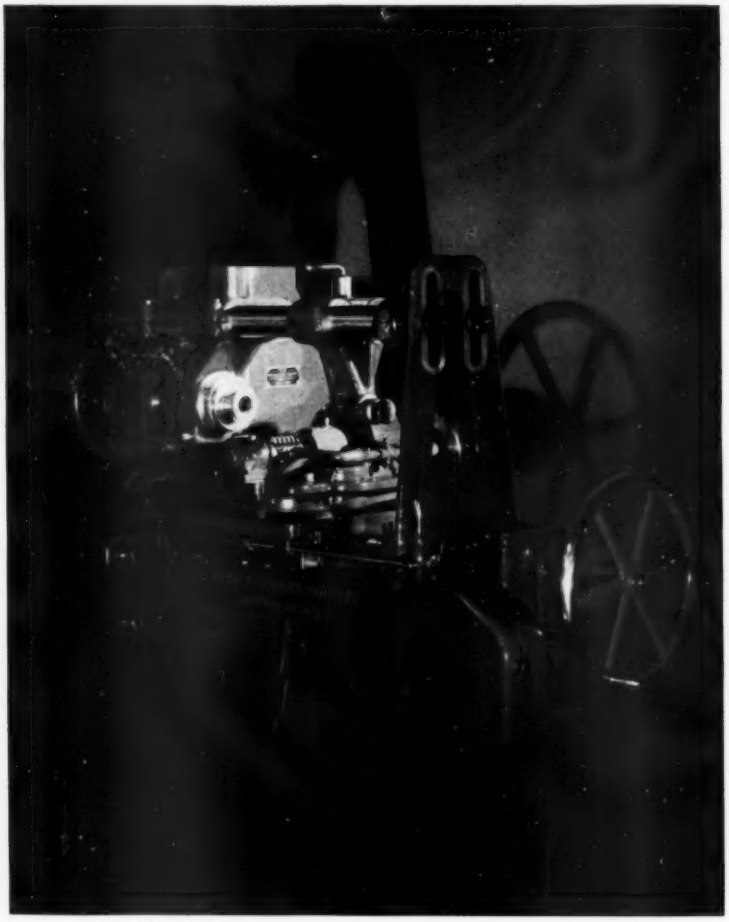

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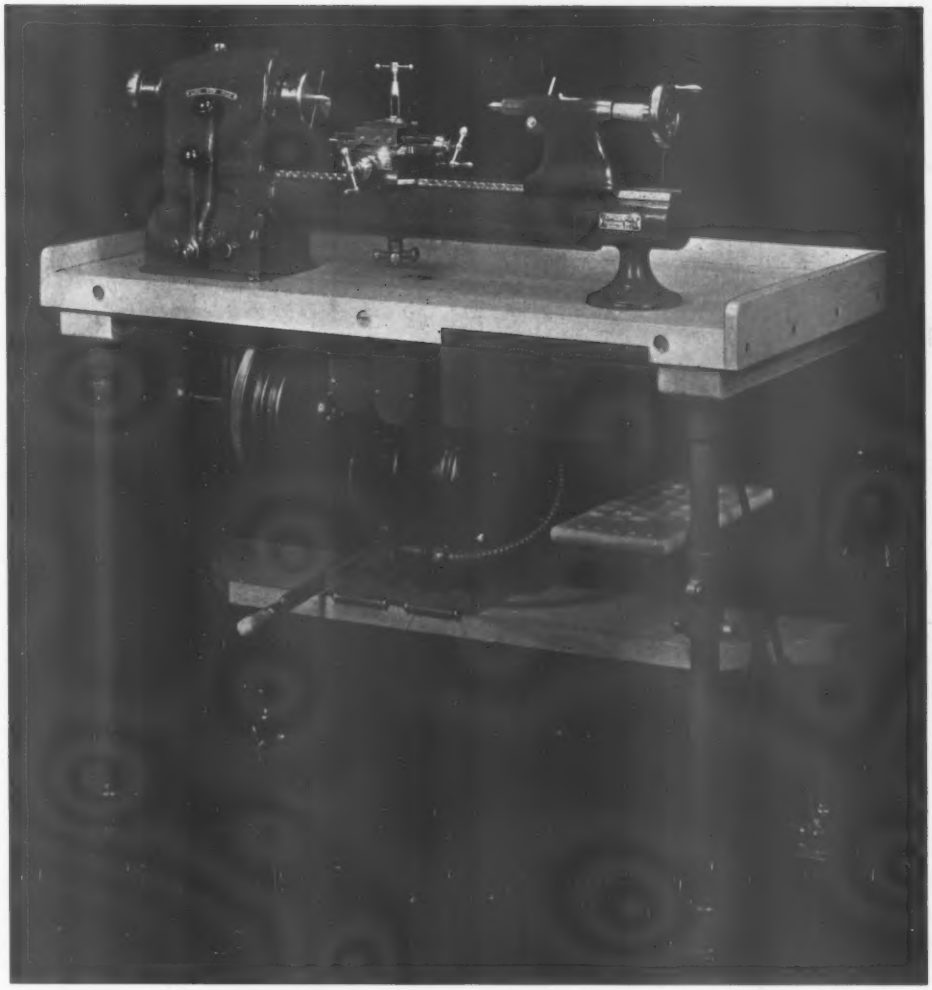

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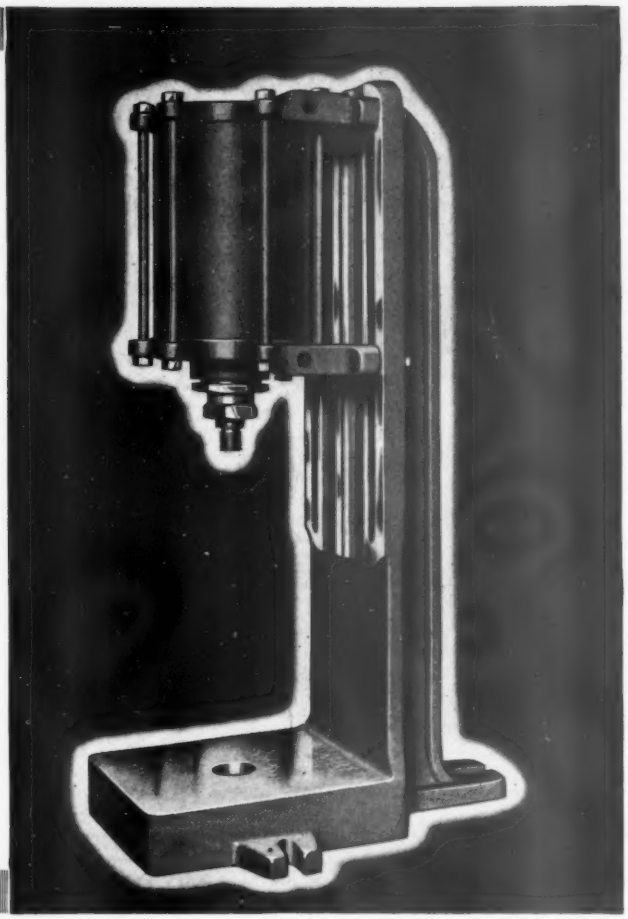

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EDITORIAL

Packard Shows the Way

by A. E. Rylander

The recently announced labor policy of the Packard Motor Car Company is to be highly commended as a constructive, conservative, and an entirely sensible advance in the realm of industrial relations. For the purpose of comment here, these three salient features are stated: (1) Vacation with pay for employees on hourly rate, (2) "separation pay" for workers cleared due to lack of work, and (3) retirement pay to employees 65 years of age or over. This policy, no doubt, considered revolutionary by many, falls far short of that extreme; rather, it is *evolutionary* in character. The only trouble with it is that it doesn't go far enough, notwithstanding that it is a remarkable advance in industrial relations. Before considering this phase, however, an excerpt from Packard President Alvan Macauley's comments is in order:

"Due to seasonal character of the (automobile) industry there are enforced periods of factory curtailment which necessitates at times the laying off of a number of employees. Throughout the industry efforts are being made to reduce these periods . . . ."

In other words, *stabilized employment is good business.* Management knows that, and concedes it, hence, supports *The Tool Engineer* in its very conservative but none the less persistent effort to effect this condition. Certainly, when one large corporation takes the lead, others will follow. On the assumption that drops of water wear away a stone, we shall carry on. For what we are mainly interested in is economic security for the Tool Engineer, and this implies not only stabilized employment but adequate compensation. We do not believe that the engineering worker's stipend is commensurate with his training; that, however, is an issue which we shall not debate at this time.

Where Packard's policy falls short is that *Industry alone cannot effect adequate retirement pay.* Only cooperation on the part of labor can bring about that result, and it is a question if American labor is as yet sufficiently awake to its responsibilities to assume its share of the burden. It is still badly muddled by demagogue exponents of impractical social justice and Utopian old age pensions. Between these schemes and social and economic security there yawns a chasm. What the worker—be he white collar or in dungarees—should consider, is a plan whereby a share of his wage offsets the employers' advance; this, then, should be pooled into an insurance policy which will serve three purposes: (1) accident insurance, (2) death benefit and (3) an annuity at retirement age. Such plans have been tried, however, the policies are usually void when a worker leaves one employer to go to another. It would seem entirely practical and workable that such a policy could remain in force during the worker's active life, by simply transferring. This plan would not only reward thrift at its source, but would be removed from the graft and corruption which is often incidental to politically sponsored plans for economic security. Nor would it impose any burden on the taxpayer.

While tentative, the plan is not advanced without consideration. It should be possible for a body of intelligent engineers, working with progressive industrialists, to evolve a means of employment stabilization and economic security at once practical and mutually fair, and which would promote harmony between employer and employee. The security of the worker rests squarely on the foundations of industry; inversely, industry will benefit from a market that does not cease with retirement age. The retired worker should be able to enjoy life, and that means at least reasonable purchase of goods he helped to create during his active years. We feel that Packard has done a fine thing. We do not in any sense belittle its plan by suggesting it is nevertheless, but a prelude to the ultimate. In that, the Tool Engineer will play his part.

PRODUCTION PERSPECTIVES

The past thirty days have seen no particular change in the level of manufacturing operations. Production continues in practically all mass manufacturing plants at about the same pace as it did the preceding month. **Machine tool sales,** usually considered a criterion of manufacturing activity do **not** appear to be a **reliable index for the month** as they **show a drop of five per cent** over the previous month—although they are **up forty-seven per cent over the same month a year ago.** The drop in orders came somewhat as a surprise, as earlier indications hinted still further gains. The **decline,** although slight, is **attributed to lessened domestic demand,** although foreign orders are up. The automotive industry, was counted on for increases in June, but it appears **retooling programs have not gotten under way** as early as had been anticipated. This condition would seem to **indicate substantial increases in July and August.** The feeling in **New England** seems to be that the **slight lull** in the machine tool sales **is a temporary condition,** with **business locally** maintaining a **good** volume. Foreign orders are being received there in fair measure, it is said.

From Boston, we hear, the **Massachusetts Senate passed the bill exempting machinery** used in manufacturing from local taxation. The Massachusetts House had passed this bill two weeks before. The bill will take some $4,000,000 from the state income tax for distribution to cities and towns in proportion to revenue lost from exempting machinery. The **measure is widely hailed** as salutary to the development and retention of industry in the state.

From **Springfield,** Massachusetts, we hear that plans for co-operating with the Mayor's re-employment committee in **promoting apprenticeship** courses and for **training skilled mechanics** were laid by the manufacturers' division of the local Chamber of Commerce. **L. E. Osborne,** Works Manager of the Springfield plant of Westinghouse, and **Charles E. Van Norman** of the Van Norman Machine Tool Company are members of the committee furthering these plans. **John B. Stodden,** of North Adams, Massachusetts, aged 64, died at his home after an illness of less than a week. Mr. Stodden, learned the machinist trade at the E. D. Jones & Sons Company, Pittsfield. In 1895 he moved to North Adams where he was employed at the **James J. Hunter Machine Company,** up to the time of his death, as foreman of the tool room.

At **Worcester,** plants all appear to be going full tilt. **Heald Machine Company, Norton Company** and others are exceptionally busy these days. **Howard R. Whitney,** general manager for Worcester Street Railways, announced **plans** for the **construction of a new machine shop** at Grove Street in Worcester to cost $65,000. Work is in progress on an **addition to the factory** at D. Street, Worcester, for the **Norton Company.**

Otto A. Boesel, for the past few years **superintendent of the Seymour Products Co.,** Seymour, Conn., has resigned **to become superintendent of** the ew **DeJur Amsco Co.,** now operating in Shelton, nn., manufacturing electrical specialties. At a well dinner given by Seymour associates, he was presented a gift. **Underwood-Elliott Fisher Co.,** Hartford, Conn., is expanding the use of the former computing machine building on Arbor street, to which the general research laboratory has been moved from New York and where the engineering staff will later be located. **George Herbert Pond,** 68, who established the English branch of the **Jones & Lamson Machine Co.,** Springfield, Vt., in London in 1898, and who in recent years has been engaged in the hardware business in New Haven, Conn., died recently. A **new factory** building, to **cost $250 000,** is under construction at the **United Aircraft & Mfg. Corp.** plant in East Hartford, Conn., to house operations of the **Hamilton Standard Propellor Division. Graham H. Anthony,** president of **Veeder-Root, Inc.,** Bristol, Conn., brass hinges, metal stamping and registering machinery, has been **elected president** of the Manufacturers' Association of Hartford County, succeeding Lucius Rossiter, **Terry Steam Turbine Co.,** Hartford. **Frederick G. Hughes,** vice-president, **New Departure Mfg. Co.,** Bristol, was named a vice-president, and **Samuel M. Stone,** president, **Colt's Patent Firearms Mfg. Co.,** Hartford, and **Charles L. Taylor,** president of **Taylor & Fenn Co.,** Hartford, members of the board of managers. . . . .**Thomas Newell,** superintendent of the **American Pin Co.,** Waterbury, from 1906 to 1917, and **previously master mechanic** for the same company, died recently in retirement at Mount Vernon, N. Y.

Edward W. Jewiss, 63, purchasing agent of the **Torrington Mfg. Co.,** Torrington, Conn., and formerly factory superintendent, died recently after 41 years with the company.

Logansport Machine Company of Logansport, Indiana **recently announced a $100,000 plant expansion** program. Of this sum $50,000 has been appropriated for a new building which is to be ready for occupancy in September. At **Anderson, Indiana** a new **factory addition to the Guide Lamp plant** of **General Motors Corporation** is to be completed August 15th. The new structure will provide some 123,000 square feet of floor space and will **be used,** largely, **for additional manufacturing facilities.** Two thousand workers are now employed at this plant. To satisfy an indebtedness of about $200,000, the **Muncie Foundry and Machine Company, discharged its two hundred employees** and turned over its machinery, materials and real estate to the Merchants National Bank, holder of the company's first mortgage bonds. The company had been engaged in the manufacture of castings for motor blocks and cylinder heads.

Studebaker, at South Bend, Indiana **had a good month in May. 8705 cars and trucks were sold** by the corporation during this month, which is, according to Paul G. Hoffman, President, the best record of sales for the month of May in the past eight years, with the exception of May, 1929. Domestic sales for May, 1936, were substantially higher than any month in the last seven and one-half years.

Many industrial supervisors and executives, including many from Pittsburgh, attended the sixth

(Continued on page 29.)

Increasing Use of Broaching

Results in New Line of Machines

by W. A. HART
Chief Engineer, Colonial Broach Co.
Member A. S. T. E.

One would have to go far back in the history of manufacturing to find an equivalent to the recent rapid development of broaching, both of the internal and surface types.

Today, many a manufacturer no longer asks "Should we try to broach this?" Rather, the first question often seems to be "*Can* we broach this piece."

In some ways, broaching machinery differs from most machine tools in that its selection as to type, capacity, and stroke depends largely on the tool to be used—the job to be done. The net effect of this was that early types of broaching machines were almost entirely special in design, with the resultant high cost and frequently low salvage values when changes in production design required alterations in the production set-up.

Such special machines rarely lent themselves well, either, to line production. Consecutive broaching operations required considerable handling of the material in process. Today, however, broaching has become so important a standby in routine production and has reached into so many fields, that it has become essential for economy's sake alone, if for no other, to make available to industry a complete line of standard machinery for every broaching need.

It was with this thought in mind that Colonial Broach Company started a number of years ago to develop a line of standard machines. Their experience as the world's largest designer and producer of broaches themselves placed them in an excellent position to determine the exact requirements for such standard machinery—what requirement were essential to cover the widest range of broaching needs, consistent with the lowest costs, for each type of machine.

It is not contended that the new line in which Colonial's design research has culminated, covers every conceivable broaching operation. There always will be special problems requiring some divergence from standard machine design practice. To attempt to provide for all these problems in standard machinery would have been futile, since the rarity of such special cases would not warrant the additional expense involved.

Except for such cases, however, the new line of Colonial broach machinery—in 11 basic types and 49 models—is "complete" in character and designed to provide popular priced standard machinery to cover practically the entire field of broaching, eliminating the necessity for most special designs with their accompanying high cost and low salvage values.

Among the many unusual features of the line is the ability to change machines over from one size to another in the event of production changes. This has been made possible at a minimum cost, by designing and producing the machines on a unit basis comprising respectively the base, column, and table.

Another feature of the line of broaching machines is the attention given to progressive line production broaching. For instance, it is possible to mount several single-ram broaching machines on a single base with continuous feed fixtures.

To facilitate this type of construction, the entire line is featured by a combination of welded steel and cast iron construction, in accordance with the best design practices. All units are operated through individual motor drives and all models have extra large coolant tanks and pumps. Design of the machines is such that chips do not accumulate around the work or tool, but drop down into large containers, which are easily removable for cleaning. Simplicity of design, construction, and operation has been a major objective throughout. Ways are in all cases made of hardened and ground steel; rams are of semi-steel and of exceptionally rigid construction. All machines are operated through hydraulic pumps, arranged for high cutting speeds and fast returns. In a number of cases variable speed controls are standard equipment. In most cases auto-

Figure 1. The new Colonial press line consists of three basic models, including the large power presses, the light duty presses, (above center) and the utility line (top right).

matic lubrication is provided and in all such types, control of the lubricant flow is such as to impart a shot to the ways every cycle of the machine.

Included in the new Colonial line are the following basic types:

Type	Series Designation
"Single Ram" Vertical Surface Broaching	VA 1
"Dual Ram" Vertical Surface Broaching	VA 1
High Speed Vertical "Pullup"	VC 1
Heavy Duty Vertical "Pullup"	VG 1
"Utility" Vertical Broaching Machine	VB 1
Horizontal Internal & Surfacing Broaching	HA 1
Horizontal "High Speed Pusher" for Broaching Small Parts	HB 1
Power Presses	VK 1
Light Duty Presses	VF 1
Surface-Broach Sharpening Machine	SFA 36
Cylindrical-Broach Sharpening Machine	SRA 72

Surface Broaching

The two lines of vertical surface broaching machines represent developments from and an expansion of the already well-known line of Colonial single and dual ram types (not shown here). They incorporate, however, a considerable number of improvements and refinements, including greater adaptability to line production, the provision as standard equipment of receding tables for work clearance during the return stroke and while loading, a considerable cleaning up in exteriors and a number of important internal operating improvements. These models are now available in tonnages of from six to 25 tons and in strokes of 36 to 60 inches, and will handle surface broaches having a maximum width of 13½ inches per broach.

Other Vertical Types

The Colonial "Utility" broaching line is also a development from a previous series with similar internal improvements (See Fig. 1). This line is available in from six to 15 ton ram capacity and in strokes of 24 and 36 inches.

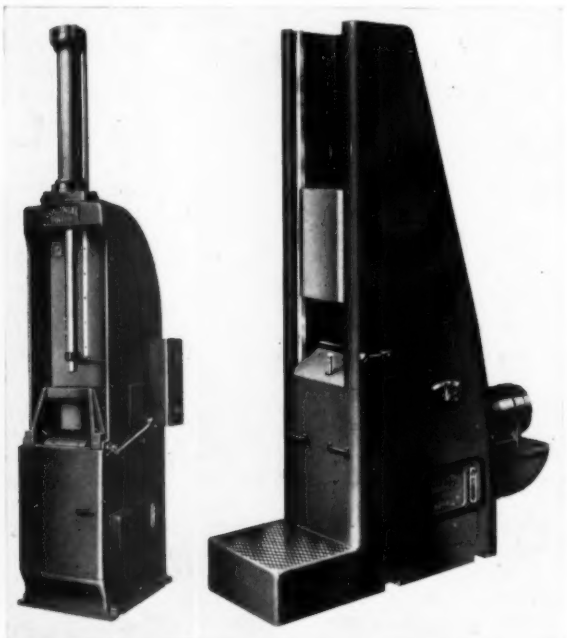


Figure 2. The new Colonial "Pullup" line comprises three models of the High Speed type shown at the left and six models of the heavy duty type shown at the right.

Another vertical machine designed for internal broaching is the High Speed Vertical "Pullup" (VC-1) series, available in three models, ranging from six to fifteen tons in capacity, with a standard stroke of 36 inches (See Fig. 2). These machines are designed for high speed production of such parts as bushings, the finishing of internal gears, etc.—instances where fairly light cuts are to be taken and a high production rate is demanded. They may be used either as single or twin-broach machines. They are particularly adaptable also to short runs where ability for rapid change-over is essential.

The ram is of the pull type, the machine being equipped with a lower cylinder to handle the broach. Broaching is entirely automatic with this construction, no handling of the tools by the operator being required. Cutting speed is thirty feet per minute with a sixty feet per minute return stroke. Drive of the 1,000 lb. pressure hydraulic operating unit is through Vee pulleys and belts from an electric motor mounted in the base of the machine. A feature of this type is that coolant is supplied to both above and below the work and is controlled by a starting handle—coolant supply stopping when the machine is stopped.

The Heavy Duty Vertical "Pullup" (V-G1) series is complementary to the VC models, being designed for similar work where heavy duty broaching is required (See Fig. 2). Its application comes in such fields as broaching large gears, long holes, spiral gears, roughing large holes, etc. This type is available in capacities of from 10 to 20 tons and in both 48" and 60" strokes. In general design the arrangement of these models closely follows the VC series with the exception, of course, that construction is even more rigid throughout. Variable cutting speed control is incorporated in this machine to provide increased flexibility for a wide range of parts production.

Horizontal Types

Designated as Universal pull types of horizontal broaching machines the Horizontal Internal and Surface Broach (HA-1) series, (not shown) comprises six models, available in from six to 20 ton capacities and in 48 and 60 inch strokes.

This group is particularly adapted to the broaching of keyways, and round and splined holes. Faceplate capacity is such that the machines can also accommodate a wide range of surface broaching fixtures with tools up to 10 inches in over-all width. Rugged follow rests can be supplied to facilitate handling of extra large broaches.

The standard cutting speed is 30 feet per minute with a variable speed control as standard equipment, connected to the hand lever. Return stroke is at the rate of 60 fee per minute. Operation is through a 1,000 lb. hydraulic pump driven by a direct coupled motor. Control of the ram is through a 4-way valve located in line with the hand lever control. Coolant supply starts and stops with the machine. This series of models is particularly notable for its simplicity of design and exceptional ease of chip cleaning.

Bearing the same relationship to the HA series as does a screw machine to a lathe, the High Speed

(Continued on page 22.)

A. S. T. E. Chapter News

CLEVELAND

The June meeting at Cleveland was a combined Dinner and Technical Session, with 42 members at the dinner which started at 7 P.M. In the drawing for the *free meal* (an idea to pass along, by the way) Mr. S. J. Hendriech of White Motors won. In view of the fact that Mr. Ford Lamb, President of the Society, was a guest, as well as the speaker of the evening, the reading of the minutes was dispensed with. Various committee heads read their reports, which indicated a very healthy atmosphere at Cleveland. The financial report was especially encouraging.

Mr. Rudolph Fintz, Chairman of Cleveland Chapter, then introduced Mr. Lamb to the assembly. The President spoke briefly about the Tool Engineer, then swung into an interesting and detailed account of the Society, its aims and purposes, membership requirements, and the benefits to be derived from it. The high lights of his talk follow, on the whole illuminating and interesting.

. . . . . .

A few years ago the manufacturer designed his product, built it, figured up the costs and then offered it for sale at a profit. Today he designs his product and finds out what the public will pay. It is then up to the Tool Engineer to produce it within that figure.

. . . . . .

The science of tool engineering wasn't taught in schools—at least not until recently. It has been developed by the Tool Engineer himself. In Detroit, a group decided that they wanted some means of bringing this science before the public, so, in 1932, this Society was organized. Some of the organizers had been members of other engineering societies, none of which offered the *Tool* Engineer the particular things that *he* wanted. The Tool Engineer's problems were different, and conclusions had to be arrived at in a different manner. Production engineers, for instance, have plenty of time to talk things over and plan their work, then, when they have made up their minds, they wait until the last minute before shooting the works to the Tool Engineer. That is why the latter wanted to organize in a way distinctive from other societies.

. . . . . .

There are men in this Society in various stages of remuneration. It is the intention to keep the dues low enough so as not to exclude those in the lower paid brackets. The Society was founded as a non-profit organization and is controlled by a Board of Directors who are elected by the membership at large. There are no paid officers. The only person who is paid is the Assistant Secretary who makes $100 per month. A new chapter must start as the result of the efforts of some individuals in that particular location; after 25 members are obtained, they can apply for a charter and National Headquarters will send an official to organize the chapter.

Since starting this organization, we have found that as Tool Engineers we have been wizards, but as *public speakers* we are a little weak. We did not have many men who could get up before a group and conduct it in a dignified manner. Tool Engineers, as a group, are unnaturally modest and are reluctant to expose themselves in front of their fellows. However, it has been a pleasure to watch the men who have taken charge, and they now can conduct a meeting as well as any one. This is their reward for their efforts.

In speaking of the benefits derived from this Society, Mr. Lamb mentioned *The Tool Engineer* Journal first. This is the official organ of the Society and will continue to get better. The Standards Sheets are of greatest importance. By their use, an attempt is being made to collect and standardize, in the most precise manner, all available data on all subjects within the scope of this Society. This material can be kept together and will become the most valuable property a Tool Engineer can have. These sheets will contain information he cannot obtain from any other source and will be available for members only. There is much work involved in preparing these sheets and it takes considerable time. The Society must contact the manufacturer of the product and explain to him what is wanted. In return, sample sheets are submitted which are reviewed by the Standardization Committee, corrected, and sent back. This process is repeated until the Committee gives their final approval.

Another benefit is the publicity and representation this Society affords. No one man can make much of a splurge, but a group of men are much more impressive. There is no reason why this profession should not have more or less to say to the Government. Without an organization such contact would be impossible. This Society also affords a means of meeting other men in the profession and getting acquainted. No one can meet with a group of men like this without being the better for it. This, in turn, develops personality and ability. One can develop himself along other lines which are foreign to his everyday work. This is very valuable. Then there is the opportunity to make contact through the Industrial Relations Committee which contacts various industries. They, in turn, advise the Society when vacancies occur.

In closing, Mr. Lamb thanked the officers for the pleasure of being there, and said he hoped to see the Cleveland Chapter have at least 250 members before the end of the year as the field to draw from is larger than any other field of technical men.

. . . . . .

At the conclusion of Mr. Lamb's talk, Mr. Fintz introduced Mr. R. S. Drummond, President of the National Broach Machine Company of Detroit, as one of the four foremost, if not *the* foremost authority on gears in the country. Mr. Drummond's subject was *Spur and Helical Gears Used in Transmissions on Automotive Production*, with a few sidelights on other types. Mr. Drummond's talk is *reported* rather than cited, hence is informally outlined. It is, however, a very valuable treatise for the Tool Engineer engaged on gear problems.

. . . . . .

Real ingenuity in gears, many varieties never

heard of, can be found in clocks. Many of these are very peculiar, especially in old clocks. As perfection is only acquired by constant changes and by keeping in contact with modern developments, so has been the case with gears. Their designs have been from one extreme to the other and then partially back again in an effort to obtain the very best gears possible. Years ago, in motor car production, gear teeth were stubbed in length because it was felt that the teeth would be stronger, but from the standpoint of life, wear, and noise, they were decidedly worse off. The tendency today is to use slightly higher tooth profiles, increase the number of teeth, add to the helix angle and carry-over, round teeth, shorter shafts—larger in diameter, and the use of involute spline shafts. Two rounded surfaces fit much better than two flat surfaces. There is a decided trend from spur gears to helical gears.

The selection of steels for gears has been constantly changing in an effort to find a steel that would give a minimum of distortion. Years ago the 1040, 1051, and 1010 steels were used; then came the 3250 and the 2512 which is a 5% nickel steel. Right now they are using the 46 series of Molybdenum steels. In conjunction with the selection of steels, you have the fabrication to consider. By different methods of forging you can increase or decrease the porosity of steel. There is a great deal of study being made on the grain-flow of steel. There are stresses created in forging that cannot be taken out in heat treatment.

In the matter of heat treating, there is a great tendency to go to gas carburizing, and more attention is being paid to temperature control, both as to temperature and time. Some of the reasons for distortion and noise in gears are teeth that are too wide, thin sections, porosity, irregular forging, irregular heat treatment, overhanging tooth parts, bell-mouthed parts, and putting gears in the middle of a long piece with heavy ends. Many types of distortion are due to cutting. By taking chips at a very high speed, you get a minimum of distortion. Properly designed cutters to eliminate pressure are also another means of lessening distortion. Bigger gears invariably make more noise than small gears.

In the matter of finishing, there is a decided tendency to do away with all operations after hardening in small gears. On larger gears, grinding and lapping are still necessary. However, grinding is giving way to lapping and lapping is giving way to previous processes wherever possible. Limits are becoming more exact. One manufacturer will not pass gears into heat treatment that exceed .003" variation from tooth to tooth.

. . . . . .

Mr. Drummond then showed several slides illustrating porosity of gears, different methods of manufacture, gears in flash line, machines with different speeds for sound-testing transmission gears, tooling used for checking index and helix angles, lapping machines, shaving machines, cutting machines, cutters, chips, machines for barreling teeth, and machines for chamfering the sharp edges on gears of all kinds. He mentioned the fact that there is a tendency to switch from external gear drives to internal gear drives.

General Notes

Upon the completion of his lecture, there was a "Question and Answer" discussion. The additional information brought out in this discussion is as follows:

The smallest lapping machine will take gears from 7/8" to 3" in diameter.

In involute splines, the male part is the only one lapped.

The maximum number of pieces you can get from a tool before regrinding is 25,000, but the average is between 5,000 and 10,000. These are held to within .003" in thickness.

You can cut gears closer to commercial limits than you can grind gears.

DETROIT

Detroit Tool Engineers laid aside their slide rules and blueprints at the Dinner Meeting of the 11th., and sat back to listen to Mr. H. H. Reinecke, Special Agent in Charge, Detroit Division of United States Department of Justice, who was scheduled to speak on *The Work and Functions of the Federal Bureau of Investigation*. Sat back, yes, then straigtened, then leaned forward in rapt attention as the speaker, without a hem or a haw, and with barely a pause between sentences, unfolded a story at once so interesting, so instructive and so thrilling that never had a man in that audience listened to its like. The speech was educational; in its clarity of expression, in absolute mastery of subject, in dramatic intensity and in humor so subtle, yet so quick that his listeners could barely respond to the extremes of high lights and shadows.

To tell the story here is impossible—it was too long — but, one left the meeting firmly impressed with the futility of crime. For those G-men get their man—some 96% of them, and gosh help the few who escape the dragnet. For these arch enemies of crime are so carefully chosen, so rigorously and precisely trained in crime detection, in arrest, in use of every lethal and near lethal weapon, and in the technique of conviction that, once set on the trail of a public enemy, apprehension and conviction—the latter often final—is just barely short of inevitable.

We learned about the finger print system; that the chances of duplication, even assuming the minimum characteristics, is but one in sextillion. Oddly enough, since that speech Ripley of *Believe It or Not* fame has vouched for one man who cannot be finger printed because he has no whorls on his fingers. The exception proving the rule, it happens. The finger print system, it seems, has uses outside of the detection of crime. A baby, finger printed at birth, can be positively identified throughout life, *and beyond that*, if decomposition has not set in. Hence, identities can be proven at any time, a valuable consideration for the honest majority.

We were told of the ramifications of crime; of criminal organization. Of the shyster lawyers who not only act as the *mouthpieces* after arrest, but who often establish prior alibis, of the crooked doctors who effect transformation of feature and characteristics, and who treat the wounded criminals, of crooked police and politicians who fattan on the proceeds of crime. We were told of the psychology of crime, of details in planning, of consideration of "overhead"—and of the fatal lapses that placed the *perfect crime* within the jurisdiction of the G-Men. For not all crimes are referred to this department of the government. Well, we could go on and on,

FIDO TRYING TO SCRATCH THE FLEAS OFF HIS BACK

. . . . has just about as hard a job as the manufacturer trying to cut die set costs without using DANLY DIE SETS

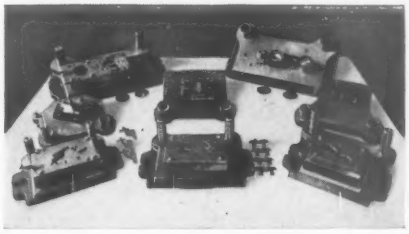
DANLY DIE SETS SAVE YOU MONEY IN THREE WAYS

❶ DANLY CATALOGING

● From Danly's unlimited number of possible combinations of die set size, thickness and material of shoe and punch holder, bushings and length of pin—you select the die set ideally suited to the job in hand—*faster*—because the new Danly Catalog is easier to use and more complete than any other listing of its type.

Write the Danly Branch Plant nearest you for your copy of this great new catalog and full details on its most profitable use.

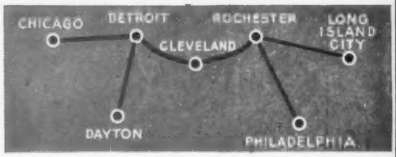
❷ DANLY QUALITY



● Danly Die Sets are more accurate—give more accurate parts—and give greater production per die before regrinding.

A typical example of Danly's longer-lived accuracy is furnished by this die for producing typewriter ribbon spool flange bottoms. Due to the speed at which these parts must be assembled, a high degree of accuracy must be maintained. Two holes and four slots are first pierced. The part is next stamped with the manufacturer's trade-mark. In the next station it is again pierced and two ears are formed at the same stroke. At the next station the part is blanked—rate 95 pieces per minute—a record due, in part, to the use of Danly Die Sets.

❸ DANLY DISTRIBUTION



● *Faster* delivery of *better* die sets at lower final costs is offered the manufacturers in each of these 7 districts by the unique Danly Distribution Plan. Danly maintains a complete stock—and an assembly plant—at each of these strategically located points. Each one is equipped to meet any die set requirement—TO SHIP WITHIN 24 HOURS—an unlimited number of possible combinations of Danly Standard Die Sets.

DANLY MACHINE SPECIALTIES, Inc., 2114 South 52nd Ave., Chicago, Illinois

Long Island City, N. Y., 36-12 34th Street
Dayton, Ohio, 114-116 N. St. Clair Street
Detroit, Mich., 1549 Temple Avenue
Rochester, N. Y., 16 Commercial St.
Cleveland, Ohio, 1444 E. 49th Street
Philadelphia, Pa., 3913 N. Broad St.

DANLY DIE MAKERS' SUPPLIES

Announcing

A NEW AUTOMATIC THREAD GRINDING MACHINE

"A MACHINE WITH A BACK-GROUND OF 18 YEARS OF PRECISION THREAD GRINDING EXPERIENCE"

JONES & LAMSON MACHINE COMPANY

(SCREW THREAD DIVISION)

A NEW THREAD GRINDING MACHINE — for thread grinding in hard or soft materials, for large lot production on machine components or for tool room work on taps, hobs, etc. It also makes possible the threading of intermittent surfaces such as those broken up by slots or keyways.

A NEW THREAD GRINDING PROCESS — the new machine is the embodiment of a new process. The grinder is designed about the trueing device as the primary element. With no attention from the operator and without disturbing the size adjustment to which the machine is continuously set, the wheel is kept sharp continually throughout its effective life. In consequence, metal is removed by a true cutting action in the form of microscopic chips instead of as dust; and in further consequence, a remarkably high rate of metal removal is obtained without burning the work; and heavy cuts can be taken without sacrificing accuracy. To sum up: the self-trueing, self-sizing mechanism of this machine brings thread grinding into the range of practical shop operations.

SPECIFICATIONS — the J&L Automatic Thread Grinding Machine will grind straight or taper or combination of straight and taper threads without adjustment of the wheel trueing device. It will grind single, triple, quadruple, and sextuple threads. Automatic wheel trueing and automatic sizing of work. It will back off, or relieve, straight or taper taps, or hobs, with either straight or spiral flutes. It will grind button type hobs, or circular chasers, without lead. Also grind and relieve thread hobs without lead. It will grind one way with quick return, or both ways. *No compensation for lead is required under any conditions, nor is it necessary to readjust the angle of the trueing device when helix angle is changed.*

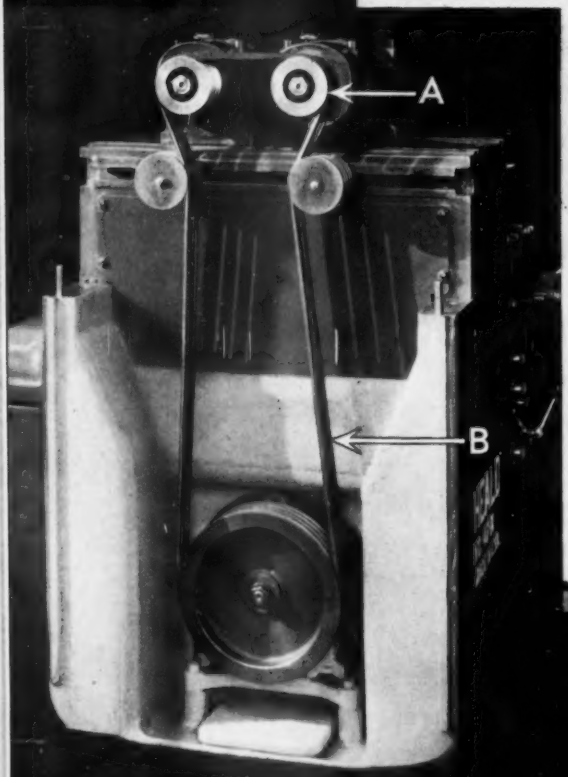
STANDARD CAPACITY — 8″ maximum thread diameter and 9″ maximum thread length. 11½″ maximum diameter of work and 31″ maximum work length between centers. The machine will grind 9″ of thread anywhere on 24″ work. A 20″ wheel is furnished as standard equipment.

Detailed description will be found in our new booklet. It will be sent on request.

SPRINGFIELD, VERMONT, U. S. A.

PRECISION BORING PLUS!

+ Economy
+ Flexibility
+ Utility



Not only do Heald Bore-Matics give every advantage offered by precision borizing with a diamond or cemented carbide tool but their design and construction were basically correct from the start and several years of use in various manufacturing plants have definitely proven exceptional ECONOMY, FLEXIBILITY and UTILITY of operation.

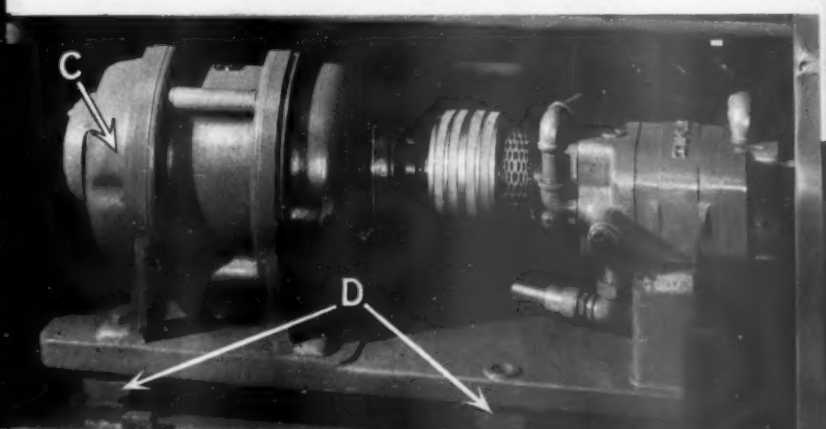
ONE OR TWO BORE-MATIC FEATURES ARE SHOWN BELOW. THERE ARE MANY MORE. ASK US WHAT THEY ARE.

A—Wide range of boring spindle speeds assures maximum efficiency for all types of materials and sizes of holes.

B—Multiple V belt to boring heads gives a positive, powerful and vibrationless drive.

C—Single motor-drive for the entire machine—minimizes vibration and improves economy.

D—Vibration dampeners under motor and pump unit completely isolate vibration from base.



The HEALD Machine Co.
WORCESTER, MASSACHUSETTS
U. S. A.

so broad was the vista opened by this speaker. We understand, however, that copies of the speech can be had by referring to the office of the Detroit Secretary, 31 Melbourne Ave. The copies are $1.00 each (this is not an ad, by the way) which is little enough considering that the speech covered some 12,000 words—*and every one interesting.* Many members have already applied for copies.

At the close of his speech, Mr. Reinecke was accorded one of the most enthusiastic ovations ever tendered a speaker at an A.S.T.E. meeting. He was also tendered an unusual compliment. One of his hearers challenged (with prior apology) the misapplication of a word—the *only word* misadvertently applied in the entire talk. Ordinarily, the correction might have been attributed to thoughtlessness or even to rudeness, but to an intelligent audience and to an unusually intelligent speaker, the intent was obvious. It was a sincere tribute to a speaker who missed perfection by roughly .00008%—the direct antithesis of the perfect crime, so to say. The challenge was at once indicative of the close attention of the audience—better appreciated by those who listened to the machine gun like delivery of the speaker—and illustrative of the almost subconscious attention to detail on the part of the trained engineer. We will be a long time waiting for another speaker of Mr. Reinecke's calibre, but should he come again—then, reserve far, far ahead of time. . . . . .

The June meeting was one of the best attended that Detroit has enjoyed in a blue moon. The dinner was *good*, and we especially enjoyed the company of visitors from the land of the Mikado—several Japanese Tool Engineers and production men. Among them was Mr. Albert N. Little, Production Manager of Nissan Jidosha Kaicha, Ltd. of Yokohama. Also, there were introduced three of his conferers, fine, intelligent looking men from the Land of the Rising Sun. What were their names . . . . Jerry and Harry, and—we just can't recall. We hope they come again, that we may further our acquaintanceship. Thus ended the spring session, in enthusiasm and good fellowship, and with a bright promise for bigger and better things next fall. In the meantime, we will have picnics and golf tournaments, perhaps a stag or two, and plenty of work for the various committees. For, A.S.T.E. forges ahead, with prospects of an international order well within the bounds of probability.

Letter from a Reader

General Electric Company

June 9, 1936

The Tool Engineer,
2842 W. Grand Blvd.,
Detroit, Michigan.

Dear Editor:

Your article "Who will go the farthest in Tool Engineering" is quite interesting and it is expected it will bring quite a discussion.

From my observation, actual practice and contact with hundreds of men of all caliber I will try to point out the best suited man for this position.

A man with about 3 years of apprentice training in a tool shop; 1 year of tool designing; 3 years of technical college and about 2 more years of training in other tool shops.

If this young man can make friends with the "old timers" and listen to their advice instead of pretending to know it all; if he will not mind getting his shop coat a little dirty; if he will keep his ears and eyes open to jobs of interest; if he will not be afraid to ask reasonable questions; and if he will not make the other fellows feel too much that he is of a higher class because of his college education, he will have it all over the man with only one side of the training.

He will know how to design the tool so it will work properly, make it as simple as possible, combine operations, suggest to the production engineer to change parts so they can be manufactured easier and with less expensive tools.

Men of this ability are not so plentiful and are always wanted and paid pretty good money. He will not have any difficulty finding a position and will be like good bait to a hungry fish.

H. Bernadt,
General Foreman,
No. 17 Tool & Die Dept.

Multum In Parvo

(Meaning: You said it, Eddie.)

The following letter, from the bulletin board of Midland Steel Products Corp., embodies fundamental truths. We pass it along as an example of clear, terse expression.

June 15, 1936

Subject: Slants on Wages, Production and Sales.
To All Employees:

1. Wages come from the money customers pay for the products they buy. If there were no purchases by customers, there could be no production and, consequently, no wages.

2. To buy the products of other people's labor, customers must have money to spend.

3. Anything that helps to increase the purchasing power of customers and prospective customers, such as greater income, lower prices, and lower taxes, helps sales and production, and makes more money available for wages.

4. When customers spend, they want their money's worth. The lower the prices at which products of acceptable quality can be sold, the more and oftener customers will buy, and the more customers there will be.

5. Anything that helps to improve the quality of a product without increasing its price, or that makes possible a reduction in the price of the product without affecting its quality, will, therefore, tend to encourage more buying, expand sales, boost production, increase jobs, and make desired wage improvements possible.

6. Low-cost production is the only sure foundation for high wages and prosperity.

Edward J. Walker,
Director of Safety.

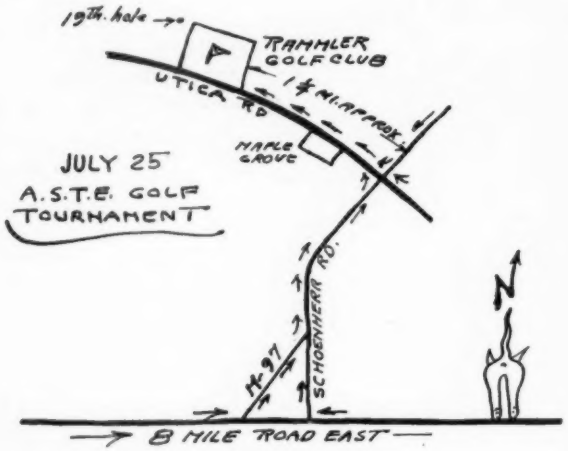
Henry & Wright—Embossing Press Appoint Sterling-French Detroit Agents

Sterling-French Machinery Company, New Center Building Detroit, announce their appointment as exclusive sales representatives in the Detroit area for Henry & Wright Manufacturing Company and Embossing Press Company, of Chicago, Illinois.

The Nineteenth Hole

Now then, you golfers, give this the 00, because there "ain't gonna be no" more said about the A.S.T.E. tournament except for a li'l postcard reminder between now and the tee-off. Here's the lowdown:

The date is **July 25th,** (mark that in red on the calendar) the day is Saturday. and the place is the Rammler Golf Club on Utica Road, near Maple Grove where the big A.S.T.E picnic was held. Look at this map—then you have the whole story of date and place.



The Map

There will be 18 holes of golf, also a hot and cold lunch—and a good one—all for the nominal sum of $1.50. Beer is extra, of course, and you can play more golf if you wish at 25c additional charge. There will be plenty of competition, fun galore and table service for the lunch. And, *prizes.* Yessir, real prizes. Eating time is set for about 4:30, at which time all alibis and post mortems will be interspersed with the latest good story. For the rest, use your imagination.

Tee-offs will be staggered, the way the Indianapolis races are run, so be sure to arrange for starting time. Tickets will be available even before *The Tool Engineer* reaches you, so call the Secretary's office and make reservation for yourself and friends. But whether you make reservations or not—COME! We shouldn't tell you this, but one of the boys has promised to make a hole in one if he has to—but that's the part we're not supposed to tell about. Don't forget—July 25th for the big A.S.T.E. Golf Tournament.

Worcester, Mass.—The George F. Wright Steel & Wire Co. announced to its employes June 17 that the company would grant a week's vacation with pay to all employes who have been with the company five years or more. The vacations will be taken by the employes during August.

RELATIVE ACCURACY

The following is intended to assist in obtaining a clear conception of the relative accuracy of lengths, areas, and volumes when the given linier dimensions are expressed with a limit.

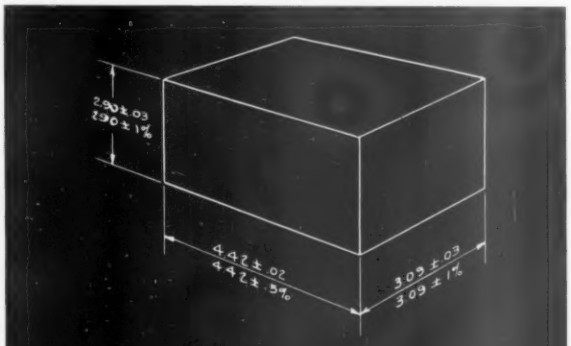


FIG. 1

	LENGTH		WIDTH		HEIGHT	
	IN.	RESIDUAL	IN.	RESIDUAL	IN.	RESIDUAL
	4.46	.04	3.13	.04	2.95	.05
	4.40	.02	3.10	.01	2.85	.05
	4.45	.03	3.14	.05	2.90	.00
	4.43	.01	3.05	.04	2.90	.00
	4.38	.04	3.05	.04	2.85	.05
	4.42	.00	3.10	.01	2.95	.05
	6|26.54	6|.14	6|18.57	6|.19	6|17.40	6|.20
AVERAGE	4.42 ± .02		3.09 ± .03		2.90	.03
RELATIVE ERROR	.02 / 4.42		.03 / 3.09		.03 / 2.90	
% ERROR	.5%		1%		1%	

FIG 2

The block in Figure 1 is measured 6 times, the averages of these lengths are shown in Figure 2. The difference between the average length and the measurements is called residual. Average length= average residual is the dimension to be used in the mathematical computations.

The actual, relative and percentage errors are changed accordingly as the operations of addition, subtraction, division, and multiplication are involved.

When linier dimensions are added or subtracted, the actual errors are added.

This means that if several lengths were added, the result would be correct even if all the lengths considered were equal to the low limit, or if all were equal to the high limit.

If two dimensions having actual errors are multiplied, it becomes necessary to add the relative errors, or since the relative errors expressed as decimals are similar to percentage errors, it is better to use percentage errors.

A study of the following will show why this is true:

(A+ 2%) (B+3%)=

(A+2 of A) (B+3% of B) =

(1.02 A) (1.03 B) = 1.0506 A.B. = AB + 5% of AB = AB + 5%

(A—2%) (B—3%) =

(.98 of A) (.97 B) = .9506 AB = AB — 5% of AB = AB — 5%

(Continued on page 28.)

BROACHING INCREASING

(Continued from page 12.)

"Pusher" (HB-1) Colonial horizontal surface push type broaching machine is ideally suited for continuous production of small parts, such as are used in washing machines, typewriters, small automobile parts, etc. (See Fig. 3). Coming in a standard 36 inch stroke this six ton model is specially designed for the provision or addition of magazine-feed hoppers. Thus, it makes possible continuous production with a minimum of attention on the part of the operator.

Two Types of Presses

For the broaching of large spiral and straight gears, ring gears, etc. and for large surface broaching up to two feet in width, a line of "Power Presses" of the double column type (VK-1) are provided, available in any capacity (See Fig. 1). Length of stroke is easily variable on this type of construction so that virtually any length of stroke can be supplied as standard. These power presses are also notable for their simplicity of operation and rigidness of construction. Operation of rams is

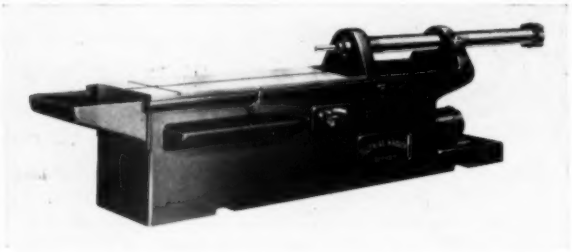


Figure 4. In the line of Colonial Horizontal Broaching machines, is this High Speed Pusher designed for continuous surface broaching of small parts.

hydraulic, as in all other Colonial types, with an operating pressure of 1,000 lbs. per square inch.

At the other end of the range, for light shaving with surface type broaches, broaching of small keyways, pressing in all bushings and other assembly work, etc., there is a series of three Light Duty presses ranging from one to four tons in capacity (See Fig. 1). All models of this VF-1 Series are produced with an 18 inch stroke and are also hydraulic power operated.

Broach Sharpeners

Included in the new Colonial line of broaching equipment are two new models of broach sharpeners. These new designs are provided with direct drive spindles. Broach-driving head-stocks are driven separately through a two speed gear box, eliminating all belts and pulleys. Special attention has been given in the design of these machines to protect them against grinding dust.

The line comprises model SFA-36 (not shown) designed for sharpening surface broaches and model SRA-?? (not shown) for cylindrical broaches.

Both types are notable for their simplicity and compactness and are designed to overcome the difficulties inherent in grinding the under-cut associated with the grinding machines commonly used for broach sharpening.

The manufacturers claim that a reduction of ⅔ in time required to sharpen broaches is quite common with this type of equipment as compared with the make-shift equipment still in general use.

HANDY ANDY'S WORKSHOP

Sat in with the Board of Directors the other evening—well, that is, on the *sidelines*—and watched that body go through its paces. Rather an experience, which I pass alnog (vicariously) to ASTEers **N**orth, **E**ast, **W**est, **S**outh. Not the individual discussions or details, but general impressions. One leaves such a conference quite convinced that the management of the American Society of Tool Engineers is in *capable* hands, and that, allowing for little differences of opinion, there is accord in the main. The body functions smoothly and efficiently, without much wasted motion. There is fairness and consideration, *carefulness*, and a prevalence of common sense.

. . . . .

As the A.S.T.E. is a credit to the engineering profession, so its Board of Directors is a credit to the membership which elected it. The passive or casual member — as differentiated from the leader or worker on committees—often has little conception of the work entailed in running an organization of the nature of the A.S.T.E. This work requires executive ability, and the demand on officers, directors and committee chairmen—and their co-workers—is only to a degree less severe than that imposed on industrial executives. As the president of a corporation directs the affairs of his company, so the president of A.S.T.E. directs the various departments of the Society; each subordinate officer directs, in turn, his department. Entertainments, meetings, A.S.T.E. Standards, the edition and publication of *The Tool Engineer*—these things don't just *happen*. They are the result of plenty of hard work, usually engaged in after the day's work is done, and the committee members are tired. Yet, they perform these extra tasks cheerfully and, on the whole, efficiently.

. . . . .

For the benefit of the possible member who perchance reads *The Tool Engineer* casually, we suggest that at least one authority has declared it the most progressive and the most interesting "*organ*" in the country. We knew that, of course, but didn't know that national authorities agreed with us. Well, it's going to get better and better as we grow.

. . . . .

Perhaps the greatest achievements of the Society are the A.S.T.E. Standards. We say *achievements*, because the Standards are a real accomplishment, not just something to be talked about. They are being accepted. If anyone should doubt this, it would do them good to sit in at a Standards Committee meeting some evening, and see that group at work. Stacks and stacks of mail, from all over the country. Letters of inquiry, blueprints, forms, sheets for approval—*and every item is given its due share of attention.* On the whole, the response is very encouraging and very cooperative, as the largest machine tool builders and tool manufacturers in the country either have adopted them or consider doing so. Needless to say, these Standard Sheets will eventually save the American engineer and industrialist millions of dollars. Yes, gentlemen, the

(Continued on page 25.)

How Center Drive Provides Advantages On Model 10 Automatic Stub Lathe

Turning the rear axle shafts shown in Fig. 1 prior to grinding includes a straight diameter on one end and, on the other, a straight portion, a taper, a collar and a thread-diameter. The collar is formed, with two radii; the thread diameter has a radius or groove at the shoulder, a chamfer at the end. The standard Sundstrand Model 10 Stub Lathe; with its ease of set-up, automatic operating cycle, cam bars for forming, and tool relief; is an excellent machine for these operations. Having extensive experience in this work, and in the design of center drives, our Engineered Production Department applied an overhead slide and center drive to the Model 10 Stub Lathe, as shown in Fig. 2. This arrangement turns both ends of a shaft at one time, increases production, saves floor space, maintains required limits accurately, saves 50% of the operator's time, reduces capital investment. These lathes can be applied easily to other double-end turning, or center-drive and overhead slide can be removed so that the machines can be tooled for a wide variety of different work.

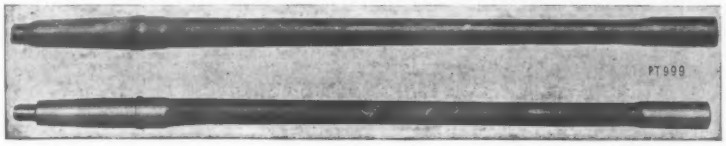


Fig. 1—Above, a rough axle shaft forging as it comes to the Sundstrand Model 10 Automatic Stub Lathe. Below it, a similar part after turning both ends simultaneously.

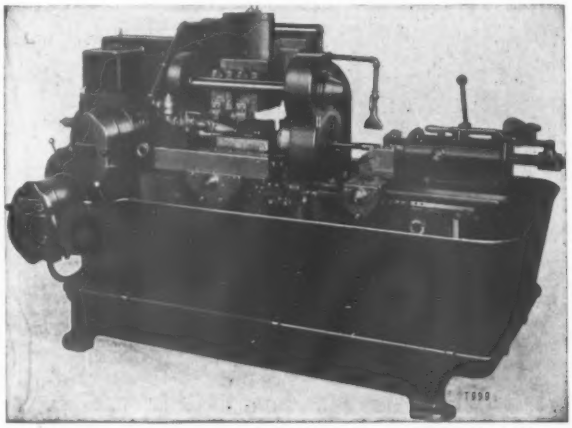


Fig. 2—Sundstrand Model 10 Automatic Stub Lathe, with center drive and overhead slide, for turning axle shafts.

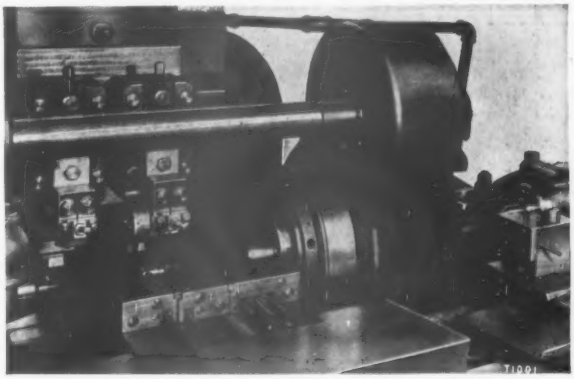


Fig. 3—Close-up of center drive, overhead slide, and tooling for turning axle shafts.

Investigate. Write today for literature on Sundstrand Stub Lathes. Send drawings and data for a reliable Engineered Production estimate.

A.S.T.E. Standards are a real achievement. But then, so is the American Society of Tool Engineers.

. . . . .

Now that you have read the above, you should have a better concept of the A.S.T.E. It isn't merely a society; it is an *institution*. It has a serious purpose, and is fully justifying the purpose for which it was organized. Perhaps we should have used a plural term, since there are many ramifications to the activities of the Society; however, all these can easily be grouped in one inclusive term—to promote the professional standing of the Tool Engineer. That, the A.S.T.E. is doing. When you consider all these things you can place a higher value on your membership; you may the more enthusiastically sell your Society to your friends in the profession. United, we're marching onward to greater accomplishments.

Springfield, Mass.—Employes of the Van Norman Machine Tool Company, 225 strong, held their annual outing June 12 at Turner Park. The program included field games, prize contests, a dinner and dancing.

A.S.T.E. Standard Data Sheets Mailed

All members who had paid their 1936 membership dues received in the mail, the last week in June, the second mailing of the Standard Tool Engineering data sheets. These very valuable data sheets are of a specified size and on a heavy rag paper, punched to fit the standard three ring binder and each sheet is 8½" x 11" so that they may be filed, if desired, in the regular letterhead size file.

All sheets of this series are, and will be, indexed in the upper outside corner for easy reference and filing. Each piece of equipment, whether it be a machine, small tool, gage or some accessory used by the Tool Engineer is indexed in this manner by its usual name.

A very considerable amount of time and effort has been spent by the A.S.T.E. Standards Committee with the co-operation of many manufacturers of various equipment, in creating a standard form of presentation. This enables the Tool Engineer accustomed to the use of any individual data sheet in the A.S.T.E. series to easily locate the specific information he desires on any other equipment listed in this series.

The Barber-Colman Taper Spline And Type T Hobbing Machine

Illustrated on the front cover of this issue is a shaft with a Barber-Colman Taper Spline, and its mating part. The taper spline is a better way of mounting machine members on shaft ends. Com-

Figure 1

pared to other methods, the Barber-Colman Taper Spline has outstanding advantages viz.—(1) Increased contact area, greater strength (2) Keys in both mating parts are integral; cannot twist, turn, or loosen. (3) High accuracy. (4) Provides solid metal - to - metal seating on accurate tapered surfaces, does not weaken the shaft. (5) Easily machined, economical.

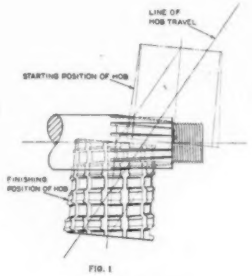


Figure 2

Taper spline shafts are produced in one operation by the Barber - Colman Type T Hobbing Machine shown in Fig. 1. In many respects this machine resembles the Barber-Colman Type "A" Hobbing Machine—and it can be used for all kinds of standard hobbing work when not employed on taper splines.

In the Type T Hobbing Machine, the hob feeds across the work as well as longitudinally. The diagram, Fig. 2, shows the angular path of the hob in relation to the work. The hob is tapered, the longest teeth entering the work first and cutting the deepest part of the keyways. As the operation progresses, shorter teeth cut the shallower portion of the splines until the work is finished. One hob can cut a variety of tapers on a given size of shaft, but different hobs are required for different shaft-sizes. Micrometer dials on the work slide and main feed screw aid in positioning these members accurately for loading. A scale on the overarm and a fixed stop are used to locate the work. A single gear box on the left end of the machine contains all the change gear trains so that the complete set-up can be made easily. All of the controls are conveniently placed on the front of the machine.

The machine is driven by an electric motor mounted in a well ventilated compartment of the base. Automatic stops and safety stops are provided on the two traversing slides. A quick-action tailstock helps to speed up work handling between cuts. Centralized pressure lubrication supplies adequate oil to all important points. Bedways are protected by heavy telescoping guard plates. Coolant is strained of chips and circulated through reservoirs in the base. The machine is ruggedly made throughout, is accurate to an unusually high degree, does not require specialized skill on the part of the operator.

A view of the mating part, or hub, for a taper spline shaft is shown in Fig. 3 (with the shaft end in the background). Production of the hub is extremely simple. It is necessary only to bore or ream a taper hole and then pull through a straight multiple spline broach. When placed in position on the shaft-end the inclined surfaces, of the keys in the hub seat, solidly on the tapered keyways hobbed in the shaft. The straight keyways in the hub fit accurately on the outside diameter of the shaft. A nut on the shaft-end is necessary merely to insure that the mating parts remain in proper contact. This construction has the same amount and distribution of metal in shaft and hub, is at least three times as strong as a single key, is fully as accurate and economical of production.

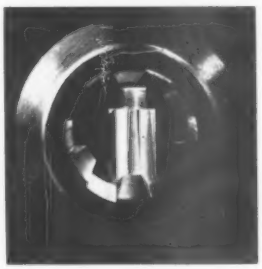


Figure 3

Figure 4

The test piece shown in Fig. 4 duplicates the drive shaft connection to the universal in a well known truck. With ordinary construction this joint has a torque capacity of about 50,000 inch-pounds. With the Barber-Colman Taper Spline, the torque capacity of the joint went up to 232,000 inch-pounds which was the limit of the testing machine used. At this point the joint showed no sign of failure and was not distorted in any way.

Barber-Colman taper splines are suitable for any kind of machine or mechanism in which a gear, wheel, pulley, arm, or similar unit is to be mounted removably on the end of a shaft, hub, axle, or other member; and it can be produced without difficulty in any of the commonly used material.

RELATIVE ACCURACY

(Continued from page 20.)

Since $(A+2\%)\ (B+3\%) = AB+5\%$, and $(A-2\%)\ (B-3\%) = AB-5\%$ it follows that $(A+2\%)\ (B+3\%) = AB\pm5\%$.

$$\frac{A+2\%}{B-3\%} = \frac{A+2\% \text{ of } A}{B-3\% \text{ of } B} = \frac{1.02A}{.97B} = 1.05$$

$$\frac{A}{B} = \frac{A}{B} + 5\% \text{ of } \frac{A}{B} = \frac{A}{B} + 5\%$$

$$\frac{A-2\%}{B+3\%} = \frac{A-2\% \text{ of } A}{B+3\% \text{ of } B} = \frac{.98A}{1.03B} = .95$$

$$\frac{A}{B} = \frac{A}{B} - 5\% \text{ of } \frac{A}{B} = \frac{A}{B} - 5\%$$

$$\text{Then} \frac{A\pm2\%}{B\pm3\%} = \frac{A}{B} \pm 5\%$$

Athol Mass.—Frank E. Weaver, 57, foreman at the L. S. Starrett Company and prominent Mason, died June 15 at his home here.

He was a native of Greenfield, came to Athol at the age of 16 and has been employed by the Starrett Company 30 years. He was a member of Starrett's Band, now the Athol Band, for many years. He was a member of all local Masonic bodies. He was chairman of the library trustees, president of the Starrett Company Relief Association, a member of the Pequoig Club and secretary and treasurer of the local Musicians Union.

PRODUCTION PERSPECTIVES

(Continued from page 10.)

annual Western Pennsylvania Industrial conference at Conneaut Hotel, Conneaut Lake Park, Pa., June 13 and 14. **W. C. Landis,** Assistant Works Manager of the **Westinghouse Air Brake Company,** presided at the Saturday afternoon session.

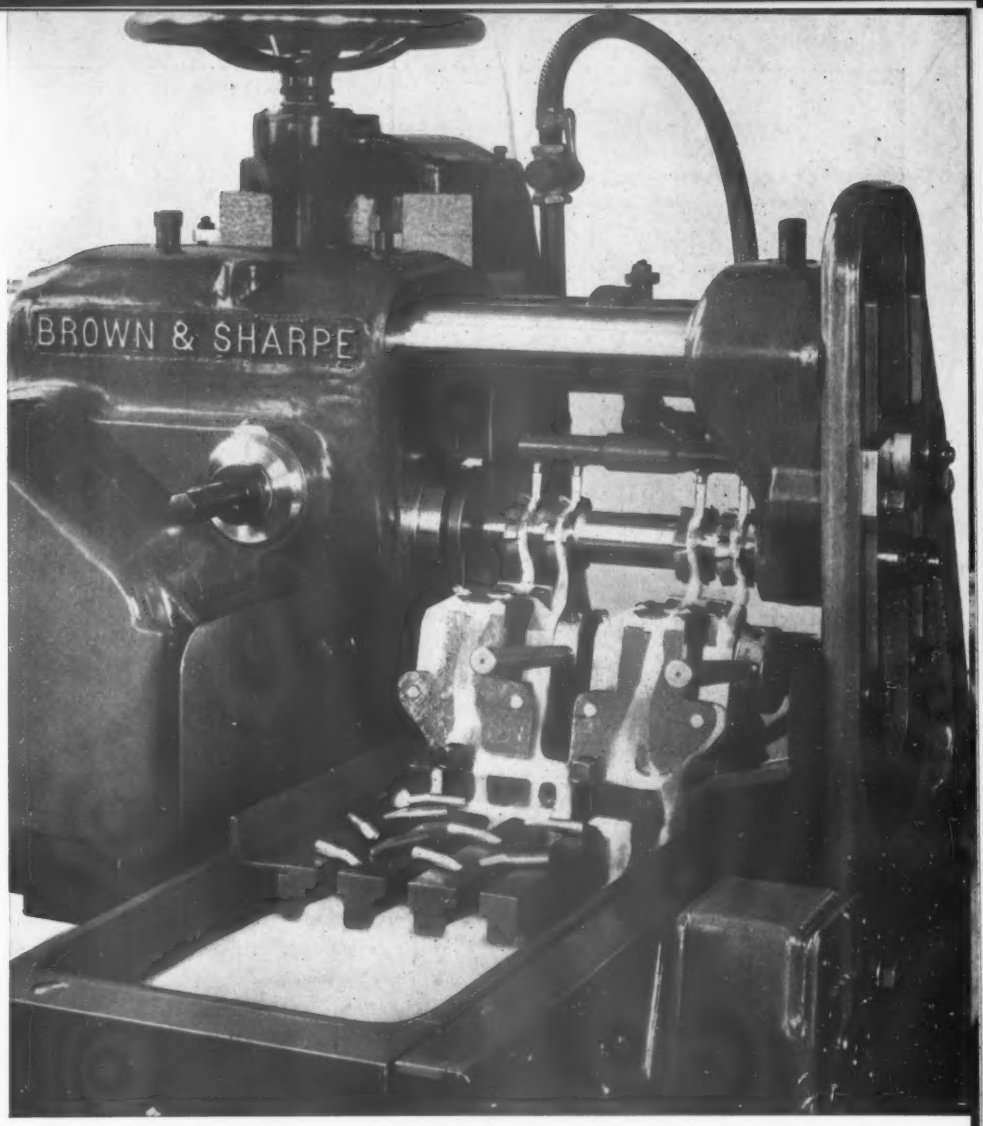
The **Dover Manufacturing Company,** thirty-six year old manufactury of electric irons and household appliances, Dover, Ohio, is **being conditioned by** the **Knapp-Monarch Company of St. Louis.** The Dover plant has been idle owing to a lack of working capital. It formerly employed about one hundred and fifty men and women. Final **details for** the **occupation** of the **old Bean Spring Company plant** in **Massillon,** Ohio, are being worked out by the **Eaton-Detroit Metal Manufacturing Company** according to **J. L. Shanahan,** factory manager for the company. Accessories for refrigerators and auto parts are manufactured by the company and **production** is expected **to get under way** in the Massillon plant **sometime this month.** The new factory will be a branch of the Cleveland plant and **will employ about 300.**

From **Detroit** comes a report that a new cutting **metal** will soon be introduced on a national scale. It is said to fall between the cast and cemented types as to general characteristics. The new metal is reported to have been undergoing intensive development for the past two years in actual mass production in one of the larger automotive plants and is said to have **achieved noteworthy results** from the standpoint **of cutting ability and length of tool life.** It is also reported the **cost** of the new metal alloy will be **comparatively low,** and arrangements are being completed to **produce and market it on a national scale.**

Packard's all-time monthly sales peak was reached in May, with a record of **7200 cars** delivered during this **month.** Coincident with this record of sales and production, comes the announcement of Packard's new labor policy, forerunner of a trend in industry which we hope becomes universal. Be sure to turn to the Editorial in this issue entitled "Packard Shows the Way."

ADVERTISER'S INDEX

A NEW COST SAVER



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